

by Sanderson on various occasions. These add to the value of the whole book, since they afford a ready means of appreciating Burdon-Sanderson's intellectual point of view in relation to biological problems.

The last chapter of the memoir gains in interest because it is devoted to the consideration of his personal characteristics and opinions. Such consideration is the salt of most biographical writings, and derives the chief part of its piquancy from the necessary introduction of the biographer's own view as to the nature of the opinions held by the subject of his account. It need scarcely be said that the essence of the piquant interest is the circumstance that the biographer now treads on ground which is open to criticism.

The present memoir offers, in its last chapter, a fair mark for comment when it implies that Burdon-Sanderson came to regard biological phenomena from what in these days would be called the "neo-vitalistic" point of view. The writings of a sympathetic intellectual, like Burdon-Sanderson, must of necessity contain statements which might give some colour for this implication, but the memoir brings forward as pertinent to the matter a letter written by Sanderson a year before his death. In this he expresses the view that a biological excitatory process (*i.e.* the condition of tissue activity) is something "organismal," by which he means "involved in organism." It is by no means clear what this connotes, but at least it is clear what in his opinion it does not connote, for he goes on to say that organismal changes, as such, are not measurable, that is, cannot be stated in terms of physics and chemistry. The writers of the memoir infer from this that Sanderson

"had come to the conclusion that physiological processes involve something which is neither physical nor chemical in nature, and which is not a mere mysterious accompaniment of these processes, but which is their essential part" (p. 169).

But in the letter already referred to Sanderson explicitly states that in science "nothing that is not measurable is known"; and it may be confidently asserted that he would never have allowed the scientifically unknowable to be incorporated in the sum of what constitutes physiological or pathological science. An organismal or vitalistic essence may find a place in other realms of knowledge, but not in one which claims to be a branch of science.

Burdon-Sanderson does not appear, therefore, to have departed fundamentally from the view which he expressed so often and so emphatically during his active scientific career and which is acknowledged in the memoir (p. 170). This view

bases modern physiology on the introduction of physical and chemical methods of experiment and explanation. Some notes made by him as late as 1903 upon "The Pathway to Reality" (the Gifford lectures of his nephew, the present Viscount Haldane) show that he then still entertained the same opinion, since he wrote that "all discovery in biology is the discovery of the operation, where before concealed, of mechanical and chemical principles" (memoir, p. 168).

Whatever may be the issue as regards the adoption of more vitalistic conceptions in the future, it seems clear that a rational point of view, such as was the mainstay of biological progress in the latter half of the nineteenth century, was one which Burdon-Sanderson deliberately adopted; and it appears that he adhered to it throughout his life.

The memoir contains a curious oversight on the first page as to the year of Sanderson's birth, this being given as 1829 instead of 1828. It is embellished by at least one admirable and hitherto unknown likeness (p. 148), this being printed from a photograph taken by Miss Acland during Sanderson's later life in Oxford.

GEOLOGY OF THE PARIS BASIN.

Géologie du Bassin de Paris. By M. Paul Lemoine. Pp. vi+408. (Paris: A. Hermann et Fils, 1911.) Price 15 francs.

THE author of this work is already known to us as one of the compilers of the geological map of France, as also for his valuable researches on the geology of Madagascar and Morocco. The present volume treats of an area which geologically has, perhaps, been more completely studied than any other part of the world by such eminent authorities as Lamarck, Cuvier, Brongniart, Orbigny, Deshayes, Hébert, Barrois, de Lapparent, G. F. Dollfus, Cossmann, H. Douvillé, and a host of others. Some eight hundred titles of books and papers arranged alphabetically under authors' names form the bibliography, although, we are informed, this is by no means to be regarded as a complete list of the literature.

Preliminary remarks are made on the subjects of stratigraphy, petrography, palæontology, and tectonics. These are followed by a full account of the various deposits extending from Triassic to Quaternary times, due recognition being given to all zonal subdivisions of the rocks, with their index and characteristic fossils, a matter of so much importance especially in the true history of the Mesozoic formations. All such details are well arranged under the numerous localities represented in the Paris Basin.

In the order of description the stratigraphical deposits may be scheduled as follows:—

Jurassic	Trias	Eocene	Thanétien
	Rhétien		Sparnacien
	Hettangien		Yprésien
	Sinemurien		Lutétien
	Charmonthien		Bartonien
	Toarcien		Ludien
	Bajocien	Oligocene	Sannoisien
	Bathonien		Stampien
	Callovien		Chattien
	Oxfordien		
	Rauracien-Séquanien	Miocene	Aquitanién
	Kimeridgien		Burdigalien
	Portlandien		Helvétien
	Neocomien		Tortonien
	Valanginien		Sarmatien-Pontien
Cretaceous	Hauterivien	Pliocene	Plaisancien
	Barrémien		Astien
	Aptien		Sicilien
	Albien	Quaternaire	
	Cénomanien		
	Turonien		
	Sénonien		
	Emschérien		
	Aturien		
	Danien		
	Montien		

The geological nomenclature employed is mostly in accordance with that adopted in the late Prof. A. de Lapparent's last edition of the "Traité de Géologie," although among the Tertiary subdivisions we note the introduction of the new term "Chattien" for the inclusion of the *Calcaire d'Étampes* and the *Meulière de Montmorency*, beds which are regarded as forming the youngest of the Oligocene series and which were previously recognised by authors as belonging to the lowest Aquitanian rocks of the Miocene period. This is an adaptation of Fuchs' "Chattischen-Stufe," established for the Oligocene Sands of Cassel in North Germany, in which also was comprised the Ormoy beds of the Paris Basin. Subsequently M. G. F. Dollfus founded the name "Cassilien" for the same horizon, but afterwards altered it to "Kassilien." On account of priority, therefore, we gladly support M. Lemoine in his recognition of "Chattien."

Students will appreciate the nine well-executed coloured geological maps that accompany this volume, as well as the numerous smaller maps and sections, showing considerable detail, which are inserted as text figures. The first of the coloured maps gives a general idea of the limits of the formations; a second is illustrative of the tectonic lines of the region; another depicts the areas where the lower Jurassic rocks are developed; a further map shows the marginal lines of the Sequanian, Portlandian, and Neocomian beds; in a fifth we have displayed the depth and altitudes of the Albian deposits; the next three explain the position of the Thanetian, Sparnacian, and Lutetian rocks, the remaining map exhibiting the regions of the Sannoisien and Aquitanian

beds. We think that the introduction of some illustrations of characteristic fossils would have been an advantage, and we are likewise of opinion that one analytical index, to include localities, genera, as well as species, names of deposits, and every other item of importance, would have been preferable to the two indices given, which only affect specific names and localities. A properly prepared index is known to be an expensive matter in the publication of a reference work, but its existence is of supreme moment to the student and professor alike, who, without wading through an extensive "Table des Matières," frequently require to make rapid reference into the geology of a district, the distribution of a fossil, particulars of a rock structure, or to some problem of tectonic interest.

The book, however, contains a mine of information; it is excellently printed, the black-typed headings to the paragraphs giving a great clearness to the text, and we strongly commend it to all geologists interested in the structure of this region of France.

R. B. N.

WIND CHARTS OF THE ATMOSPHERE.

Charts of the Atmosphere for Aeronauts and Aviators. By A. Lawrence Rotch and A. H. Palmer. Pp. 96+24 charts. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1911.) 8s. 6d. net.

THIS volume contains twenty-four charts, with accompanying text, dealing mainly with average wind conditions from ground level up to 30,000 feet, at the observatory at Blue Hill, Mass., of which Prof. Rotch is the founder and director, and at St. Louis. The book is intended for the use of airmen, and its aim is "to extend the work on surface winds and ocean currents done by Maury to the regions with which the navigator of an air-craft is concerned." The arrangement of the work, whereby all the charts appear on the right-hand page of an opening, and the corresponding descriptions on the page immediately opposite, is very convenient, and the clearness of the diagrams is enhanced by the absence of printing on their reverse sides, although this involves alternate blank openings like an atlas.

Chart 1 shows heights of clouds, and maximum heights attained by different species of air-craft. In Chart 2 is shown, *inter alia*, the average relation between wind velocity and height up to 30,000 feet at Blue Hill. The velocities in the lower layers were determined by means of kites; in the upper layers by means of theodolite observations of clouds, which took place "almost daily during two years." The curve exhibits an